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Peru, Factor 1

### **Peru: Plant science to improve the disease and drought resistance and crop yields.**

Peru is a rather poor country with slight malnutrition issues. A large portion of the population - about seventy five percent – is in poverty. The majority of these poverty stricken people live in the Andean mountain region. I have chosen to do a report on the benefits of plant science due to the fact that the main source of food for the poverty stricken part of the population are the family's farms. By improving their knowledge of the general public and their crop production techniques, we take a step closer to helping the hungry and poor. Peru is a South American country covered in mountains and rain forest. This makes it a somewhat difficult region to navigate. If these Andean citizens do not produce enough crops for their families to live off of and sell, then they will have to take a long trip into a village or urban area (depending on their location) to find a vendor or shop, from which they can buy their vegetables and grains. My overall concentration for this country is the rural Andean area, as a result of a good deal of aid and closer markets for the urban areas. Easily accessible markets make it less of a feat for urban citizens to buy anything they need. The life as a Peruvian in the rural area is much harder. Though they have been raised there their whole lives, and throughout time have all adapted to the climate, elevation, and general way of life, I believe that we have a lot to offer them when it comes to plant science and education. Teaching them more about pollination and selective breeding when it comes to plants and seeds of their own production would allow them to keep improving long after any programs are there helping them. In addition, the new knowledge can be taught to whomever they encounter. It is literally my dream to make a big difference in the world within my short lifetime. I already have a lot of prior knowledge of Peru from watching informative documentaries, speaking with people I know who have gone on mission trips to Peru, and my own interest in the beauty of the country and its wildlife. I initially hadn't considered Peru as my first choice country for this project, but I realized that I would love to make a difference in a country with so much potential.

The average family size in Peru is 5.1 people per household nationally. Urban areas register slightly larger than this while the rural areas, such as the highlands, register lower than this with a count of 4.9 persons per household. It is pretty common for both of the parents to work, if it is possible. The dominant family pattern revolves around the father as the head of the household, though the patriarchal image in most of South America is gradually fading in modern times. The male is still dominant, but on a smaller scale. Some credit of this is given to the recent decreases in male population due to migration and various poverty related issues that lead to abandonment. (Rex) The popular Peruvian diet consists mainly of rice, wheat, meats, and vegetables. The most common and important meats are beef, pork, chicken, and fish, in that order. (Adams) There are many basic sauté dishes containing a mixture of meat and vegetables that are an important staple in Peru. There are a lot of native fruits that grow within the rain forest. By far, the most important food grown in Peru on a small and large scale by many is the potato. Hundreds of strains of potatoes are grown here. The majority of the poor Peruvians lack access to basic potable water, which leads to a variety of water borne illnesses and stomach issues.

Peru is moving towards a more modern educational system. Unlike the complicated education system in the United States, Peruvian schools concentrate on basic skills like math, reading, and writing. Overall, however, it's a poor system. The schoolrooms are small and some are even outdoors or in open buildings. In many of the sections there are not enough desks so numerous kids use sawed off tree stumps, or something of the sort, for chairs. Textbooks are scarce. In most of the schools throughout the country the teacher is the only one with a book and then the students take notes while the teacher reads aloud. The main education system is in Spanish and several teachers have to deal with students who speak Quechua,

which is an ancient native dialect. There are quite a few educational aid programs in Peru trying to improve the schools and teaching methods along with how many students attend. My own thoughts are that they are really after improving the country as a whole. Getting the new generations educated is the most important step to building up the country's status. Even though school is required for children it is difficult to enforce because of all the natives and poverty stricken people that live up in the mountains and in the forest. School is required for kids that are six years of age to sixteen or seventeen years of age. Peruvian schools, like American schools, run five days a week from eight in the morning until about two in the afternoon. The school year runs from April to January. There are private schools as well as free, public schools for grades one through twelve. Those vary in price and higher education levels. Many universities, business schools, and other forms of higher education after the basic schooling are available, but these are mainly filled with children from richer families and business folks. (Steinle). Private and public health insurance systems, along with free government health services for the poor are available in Peru. This country has one of the fastest growing economies in the world right now, with a generally decent government, in my opinion, aiding as many as they can reach without being invasive. A third of the country's population is in poverty. A large number of these citizens have no healthcare plans or insurance of any kind. From what I have read though, the government is doing what it can to change this. Even though this is one of the fastest growing populations on earth right now, it still has a long way to go. (Goldberg)

Peru shares the same kind of farming methods as most underdeveloped countries, especially those of which in South America. Slash and burn subsistence farming is the most practiced method among the families and small farms. Over seventy percent of the small farms are less than five hectares (or about twelve acres). The majority of the poorer population farms are in the Peruvian highlands. In this area they have to be more concerned about irrigation. This is dramatically more difficult than farming in a field. The commercial farms are much larger and choose the lower parts of the mountains to farm. (Steinle) The kinds of crops that are grown in these small farms are important because of what they have to offer the families when it comes to protein, vitamins, and other nutrients. Some examples of these crops include: avocados, asparagus, corn, peppers, coffee (coffee is more commercial), and other vegetables, such as potatoes, which are considered the most important of the crops. If these particular crops were not available then deficiencies would be unavoidable. Other roots, tubers, and native grains are also important, mainly as fillers and sources of other nutrients. On the commercial farms, coffee, cotton, sugarcane, coca, and avocados along with other vegetables are the important cash crops. (New Agriculturist)

In this region, as I said earlier, slash and burn techniques are the most practiced. This is when the farmers chop down forest area, or an area dominated by large grasses that has not been worked. They then burn all of the vegetation that has just been cut down as well as whatever is still intact and use this unworked, fertile soil to farm. Also, the ashes they make add potassium to the soil. The families or farmers will then farm this land for one to five years and when they're finished, move on to the next patch of land. Most of the big commercial farms use the average field techniques to farm their crops with fertilizers and other chemicals.

The next sections are paraphrased by me coming from multiple accounts across the internet including most of the sources that have already been cited. Through all of my reading and information gathering, the most obvious and outstanding barriers are educational and financial limitations. The people that are poorer and use the slash and burn techniques are my biggest focus. These practices require the families and farmers to move around constantly. Most of their knowledge is just general knowledge which has been passed down through the generations from the parents to the children.

When it comes to employment barriers, Peru is not exactly terrible. As a whole, the country is actually doing fairly well in the urban areas due to the increasing industry businesses and the beneficial

government. Even with these gains, there are still many challenges, most of which are created because of the education and transportation issues. If a man lives deep in the mountains, it is difficult to support his family and get a job if there is no way to get back and forth between his job and his family. This would also explain the abandonment issues that were mentioned in the beginning of the paper. With the education limitations that the parents have in the first place, their job options are so limited that getting a job may not even be worth the daily travel.

Peru has many farmers markets and food vendors in the urban areas, and spread throughout the many cities whether they are rural or urban. After looking at multiple photos and sites on the internet I can confidently say, like I have already mentioned, that the Andes Mountain regions are the most malnourished throughout the country. Going up and down markets is an obvious restriction to market access, in addition to not having enough money to buy from a vendor or shop anyway. The biggest hindrance in my opinion are the available water sources. There simply aren't enough. Drinking from still water sources has been the leading cause of disease and even caused a few epidemics in the past fifty years, especially in children. So, insufficient clean water sources, lack of transportation, and money are the big issues that hinder the people of the rural areas.

I have chosen plant science as my key factor because I believe that it could help stop two of those major hindrances from affecting the people so badly. The majority of the Peruvians just use the common passed down knowledge to care for their gardens and farms, which limits the yields and efficiency. Many families depend solely upon the yields of their gardens and local farms as the primary source of income and food. So if they have a bad year or just simply don't produce enough vegetable and grains, then they must rely on the market. I have explained the troubles of that already. If relying on the market was not so hard then their little gardens and farms wouldn't be the main source of food in the first place. So their own productivity affects their own food availability. Having more plant knowledge of how they work biologically, and how to select the best of the better to use on their crops next year could be the key to improvement.

Plant science is not a big deal in America. There's not a big need. We can just go to the store or farmers market at almost any time and buy fresh fruits and vegetables. Most of the people who garden do it simply for enjoyment, and a little bit for cheap food. It's needed here in the same way that it is in developing countries like Peru. If anyone in America has any questioning on gardening or farming they can either go to the store and ask someone who is a professional, or go and get a book, or use the internet and find out what they need to know. Knowledge of plant science can be plenty beneficial in America if you have a specific career path that you want to follow, like me, or if you just want to experiment and have a hobby like my grandmother. Food seems to always taste better when your hard work is what got it to you. The point though is that it's not such a big deal here in America for the average person. According to the U.S.D.A. less than two percent of Americans farm for a living.

Currently in Peru and most of South America, common knowledge of digging a hole, putting the seeds in it, and giving it enough water is the extent of their plant knowledge. The Andean people are especially knowledgeable about the use of the plants though. Harvesting, and medicinal use is something that they would be able to teach us. I don't think that they need any help when it comes to that. When you Google Peruvian plant science, all you get in return is medicinal plant use, and rainforest related links. Now there are quite a few professional horticulture, botany, and herbarium institutes in Peru. One that I read quite a bit about was in Hasta Luego. These institutes include greenhouses, and microscopic level plant research on common, and native plants that are exotic to us. These are usually fueled from out-of-country organizations doing what we are doing, trying to improve the countries conditions. Most of the teachers and people of authority in these institutes are from Peru though.

Those limitations are gradually improving for Peru because of the quickly growing economy. Especially for the rural area that struggles more than the rest. Throughout the last twenty years several education institutes and hunger organizations have been formed to improve the malnutrition and financial situations. The current status of these unfortunate trends is improving every year. With more time and help the land will continue to improve at a faster rate.

Improving and spreading the biological knowledge of plants, and selective breeding is very helpful. Through selective crop breeding we can create heartier, healthier, and greater yielding crops. It isn't difficult at all when it comes to the native grains, corn, and potatoes. Earlier I said that I had read about the major importance of the potato in Peru, well, with the thousands of strains of potatoes in South America I think that it would take tedious but simple work to help develop a better potato variety that would thrive in the Andean area. That is a terrific way to gradually help every family. I'm positive that the same thing could be done to other tubers, and corn. The markets that grow and sell the food could have better quality fruits and vegetables, and the rural families would be healthier and more food secure. I haven't mentioned malnourishment much because it gets me carried away from my original key factor, but by taking care of the plant science area, we would in return also be helping the malnourishment factor of the country too. When the yields are bigger and the families can grow more food of better quality, then transportation and poverty do not matter as much because they do not have to travel to the market and buy their food.

Poverty and lack of transportation will continue to be hindrances for these people no matter what we do, short of importing technology. It will affect the market access no matter what because they live in the mountains. Mother Nature cannot be controlled, so the drought and water access can only be helped so much. Wells dry up, and water becomes stagnant. Another problem for farmers is disease. A few years ago in the Andean mountains in the city of Chaclabamba, a new disease infecting a major potato field was found and destroyed the whole crop. The disease was a kind of fungus called late blight. This is the same disease that caused the infamous potato famine in Ireland. This is believed to have happened due to the recent climate change that has happened the last 10 years around the world. It has been warmer and wetter, creating a different humidity than the farmers have ever experienced. Breeders have been rushing to try and develop a new strain of potato that is resistant to this disease. This particular disease could destroy whole populations of plants and such a large scale that an entire city or region could lose its entire crop. With potatoes being so important to Peru, this would definitely devastate the country. (Halweil)

Addressing this factor will improve security by giving the common families better quality foods to either grow or purchase. Depending on if we concentrate on the marketing farms or the individual family farms. Which again, concentrating on the individual family farms and gardens will eliminate the need to buy more food, and to travel to a market. This helps them be more financially and food secure. The knowledge that would be taught can be easily spread from family to family, and passed down through the generations until Peru is a more stable place of residence and the families aren't forced to grow their own food. I believe that this is not too far away and may happen within my lifetime. Helping the farms will make the urban areas a more secure area to live too, because the markets and shops might have a bigger variety and supply of food. Hopefully that means that they could also sell it cheaper.

Peru actually has several programs that help with food security and agriculture practices. I have found a program that I myself would like to be a part of and actually expand if I had the resources to and it is called: A Broader View. This volunteer program allows the volunteers to take part in environmental and agricultural activities. They get involved in a number of hands on projects including raising wild life, conserving the native forests, and horticulture and fish farming. This program is in Peru and Guatemala. (Volunteer Abroad) If this program was to be scaled up then the difference that could be made in Peru would be tremendous. Farming fish for meat and releasing them into the local water ways is not complicated when teamed up with folks that have been doing it professionally for years. That alone would

make a difference across the entire country and region. Then when it comes to Horticulture projects, the size of the breeding projects for better strains and hybrids of crops such as native grains, potatoes, corn, and any other vegetables would help thousands of citizens. Along with aiding the government with the handful of poverty stricken part of the population. The people would be healthier and require fewer health cares, especially the children and elderly.

The communities within the country can take a bigger role in improvement than they are. The multiple foreign aid programs and institutes are great, but to have a stronger country and increase the motivation for improvement, the communities themselves need to come up with an idea to unite the people to help each other out. My suggestion is to create something like a neighborhood garden area, or more likely, a farm. This would be separate from any of the familys' personal farms and used as a main source of education and experimenting. Along with food that can be donated to the poorer families that were unable to produce their own food, like a Toys for Tots kind of organization but with food and seeds. So this would bring the community together, while educating a large number of each community at the same time and then the crops that are produced can be dispersed to the less fortunate families whether they took part in the program or not. Donating the food would not only feed the less fortunate but get them interested in the program, because they would hopefully be thankful, they can send their kids to the program so that they can be educated for the sake of their families now, and in the future. Anybody would be welcome to take part in this. All ages and society ranks.

The individual families in the neighborhood would have to make this idea happen though. Making the idea known through door to door type of advertising, we could ask for the extra seeds that the family would want to donate, only after they have planted their own gardens. I would never want to ask them to donate the seeds that would be going directly to their family's source of food or business. Much like the greenhouse that I take part in at my Central Campus location through the FFA, the kids and other volunteers would be lead by a number of teachers from the already existing organizations, along with ones sent to Peru, to educate them and allow them to do all the work. In my own experience the best kind of education is hands on. The families would be asked to donate supplies at their own willingness, and just do as the teachers/ instructors ask. Questions comments and advice would be encouraged greatly. This would strengthen the individual families along with the community itself.

Even though Peru has one of the fastest growing economies on the globe it is a poor country with slight malnutrition issues and a large poverty population of about seventy five percent. The majority of these poverty stricken people live in the Andean mountain region. Helping out the Andean mountain region would, in all, help the whole country because the government wouldn't have to put so much energy into aiding these poor people. They would be able to concentrate on the overall development of the country in business and industries, heightening the economy. Giving the common population the knowledge of plant sciences, on a biological level, and teaching them to pick out the best crops to combine together and reproduce to create better crops for the following years is the best way to help them help themselves. The knowledge of knowing how to produce their own crops and improve them, eliminates some of the reliance on the market. Therefore they don't need to go on a little quest to the city or village to feed the family and they don't need to spend the money. If the family farm produces enough food that they are plenty secure then they can sell a portion of the food to the market places and have their own income that allows them to buy other necessities so that they can enjoy life and be happier. I like the idea of promoting the idea of a community project also. Working as one to improve their country and each other's families will give the people a greater sense of pride and motivation to help the country they belong to. So after all this research, I believe that plant science improvement would be a major milestone in the development of Peru. It is already a beautiful country with a rich diversity in culture. Helping the rural areas have more security and development would be the key to helping this country be somewhere that a person would actually want to live, and travel to.

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